

## STEP 3 Packet

### Model Technical Energy Audit & Project Proposal Contract

### For Energy Performance Contracting Services

JANUARY 2005

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[Linda.Smith2@state.co.us](mailto:Linda.Smith2@state.co.us).



### Model Technical Energy Audit & Project Proposal Contract

#### **OVERVIEW:**

This Contract for Technical Energy Audit & Project Proposal is the first of two contracts with the selected Contractor. The Contractor will complete an investment grade technical energy audit that will include an analysis of each proposed project with projected energy and cost savings and itemized project cost. The Contractor will also propose terms for the performance contract and present a proposal that includes recommended projects, financing term and projected annual cash-flow analysis. The results of the audit will form the basis for a subsequent Energy Performance Contract.

#### **NOTES TO AGENCY:**

Contact Rebuild Colorado for an updated document, as changes or improvements are made regularly. Or, find the model contract at <http://www.state.co.us/oemc/rebuildco/samples/> (or, [www.state.co.us/oemc/rebuildco/](http://www.state.co.us/oemc/rebuildco/), click on “Sample Documents” and see “Sample Documents”, then see “Technical Energy & Project Development Contract”. If you have difficulties, contact Linda Smith, Governor’s Office of Energy Management & Conservation, 303-866-2264.

- This is a model document only and does not attempt to identify or address all circumstances or conditions you may encounter or desire. Consult with your legal counsel and procurement staff to adapt it to meet your needs.
- This results in a detailed, full-scope audit. It is important to scale-back the audit to fit the potential scope and needs of the project.
- If a solicitation document (RFP or other) was used to solicit an Energy Service Company to enter into this Contract, ensure that this Contract is consistent with terms and conditions established in the RFP. Both the RFP and Technical energy Audit are recommended attachments for the subsequent Energy Performance Contract to ensure consistency and follow-through on objectives.>

**Colorado State Agencies & Higher Education Institutions:** This model contract is required as a basis for developing your site-specific contract.

**Colorado Political Subdivisions:** Assure that the RFP and contracts are adapted to comply with their procurement and fiscal laws and regulations, as well as CRS 25-12.5-101, et. seq. References to these statutes are incorporated below. Consult with your legal counsel and procurement staff to adapt it to meet your needs.

*This page for Colorado state agencies & higher education institutions only*

STATE OF COLORADO



CONTRACTOR AGREEMENT  
TECHNICAL ENERGY AUDIT & PROJECT PROPOSAL CONTRACT

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CONTRACT ROUTING NO.      Contract Routing No.

AGENCY IDENTIFICATION NO.      Agency Identification No.

PROJECT NO.      Project Number

PROJECT NAME      Department Name -- Energy Performance Contracting

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**TECHNICAL ENERGY AUDIT AND  
PROJECT PROPOSAL CONTRACT**

*Note: Find and replace "Agency" with acronym or name of facility in entire document.*

This Technical Energy Audit & Project Proposal Contract (the "Contract") is made and entered into as of Date, between ESCO Name ("Contractor"), having its principal offices at Contractor Address, and Agency Name (include official Agency name or name of Board as appropriate; for State Departments, use "State of Colorado for the use and benefit of the Department of ..... hereinafter referred to as ("Agency"), Agency Address.

**WITNESSETH**

WHEREAS, Contractor is a company with experience and technical and management capabilities to provide for the discovery, engineering, procurement, installation, financing, savings guarantee, maintenance and monitoring of energy and water saving measures at facilities similar in size, function and system type to Agency's facilities; and

WHEREAS, Contractor has submitted a Contractor Response, in response to Agency's Request for Proposals (RFP), pertaining to the discovery, engineering, procurement, installation, financing, savings guarantee, maintenance and monitoring of energy and water saving measures at Agency's facilities; and

WHEREAS, Agency has selected Contractor to provide the services described herein; and

WHEREAS, Agency desires to enter into a Contract to have Contractor perform a **Technical Energy Audit and Project Proposal Contract** to determine the feasibility of entering into an **Energy Performance Contract** to provide for installation and implementation of energy and water saving measures at Agency's facilities.

WHEREAS, if energy and water saving measures are determined to be feasible, and if the amount of savings can be reasonably sufficient to cover all costs, as defined by Agency, associated with an energy performance contracting project, the parties intend to negotiate an Energy Performance Contract under which the Contractor will design, procure, install, implement, maintain and monitor such energy and water saving measures. However, this intent does not commit Agency to entering into such Energy Performance Contract.

THEREFORE, the parties agree as follows:

**1. Technical Energy Audit and Project Proposal Contract**

Contractor agrees to perform a Technical Energy Audit in accordance with the Scope of Work described below. Contractor agrees to complete the Technical Energy Audit and

## Contract for Technical Energy Audit & Performance Contract Proposal

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tender to Agency a final report within Number of Days –120 days recommended depending on size and complexity of facilities and time needed to review the audit calendar days from the execution of this Contract.

Agency agrees to assist the Contractor in performing the **Technical Energy Audit** in accordance with the Scope of Work described below. Agency agrees to work diligently to provide full and accurate information. Contractor agrees to work diligently to assess validity of information provided and to confirm or correct the information as needed. The parties contemplate that this will be an iterative process and that Agency will have a reasonable amount of time to review and determine acceptance before issuing the **Notice of Acceptance (Exhibit B)**.

Contractor agrees to offer a **Performance Contract Proposal** with a package of energy and water saving measures and with details as specified in the Scope of Work below.

### 2. Compensation to Contractor

Except as provided for in **Subsections 2(a), 2(b), or 2(c)** below, within Number of Days: 120 days recommended days after Agency's acceptance of the final **Technical Energy Audit and Project Proposal Contract**, Agency shall pay to Contractor a sum not to exceed Dollar Amount in Words (\$ dollar amount) based on a maximum of square footage to be audited gross square feet at cost per square foot per square foot of audited square-footage *Note: Expect about \$0.07 to \$0.15 per square foot depending on project complexity, size and scope of project, and geographic location.* Agency shall only pay for square-footage actually audited. Areas deemed by Contractor not to be audited will not be charged to Agency.

- a. Agency shall have no payment obligations under this contract provided that Contractor and Agency execute an Energy Performance Contract within Number of Days – *allow sufficient time for contract negotiation and signing; 120 days recommended* days, after issuance of the **Notice of Acceptance (Exhibit B)** of the final **Technical Energy Audit and Project Proposal Contract**, but the fee indicated above shall be incorporated into Contractor's project costs in the Energy Performance Contract.
- b. Should the Contractor determine at any time during the Technical Energy Audit that savings cannot be attained to meet Agency's terms as set forth in the **Scope Guidelines and Requirements (Section 3.b)**, the Technical Energy Audit will be terminated by written notice by the Contractor to Agency. In this event this Contract shall be cancelled and Agency shall have no obligation to pay, in whole or in part, the amount specified in this **Section 2**. *Note: the maximum financing term used in the audit must match the financing term given in the RFP.*
- c. Agency shall have no payment obligations under this Contract in the event that Contractor's final **Technical Energy Audit and Project Proposal Contract** does

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not contain a package of energy and water saving measures which, if implemented, will provide the Agency with cash savings sufficient to fund Agency's payments of all costs and fees associated with the Energy Performance Contract, including 1) the fee associated with the Technical Energy Audit, 2) all monthly payments on a lease purchase agreement to finance the measures, 3) any annual fees for monitoring and maintenance incurred by the Contractor. Analysis will be based on proposed financing terms including a conventional, fully amortizing lease-purchase agreement not to exceed the term set out in **Section 3.b)1** over a fixed rate or interest actually available to Agency. *Note: The maximum financing term must match the financing term given in the RFP.*

### 3. Scope of Work

*Note: It is tempting to develop a prescribed scope of work, detailing exactly what projects the Contractor should undertake in your facilities. This is not recommended, however, because it is very valuable to use the Contractor's technical expertise to help identify and assess the opportunities that are most cost-effective or most valuable for your facilities instead of pre-determining the scope.*

The Technical Energy Audit and Performance Proposal Contract shall be performed as described below:

#### a. Process

This will be an interactive approach in working with Agency, following these steps:

- 1) Preliminary Assessment of Needs and Opportunities
  - a) Meet with Agency to establish interests, plans, problems, etc. related to facilities and operation of facilities.
  - b) Collect data and background information on buildings, equipment and facilities operation
  - c) Perform a preliminary walk-through of facilities and interview staff and occupants to identify potential measures
  - d) Meet with Agency to present preliminary findings and establish agreement on measures to analyze
- 2) Preliminary Analysis of Measures
  - a) Establish base year consumption and reconcile with end-use consumption estimates
  - b) Conduct a preliminary analysis of potential measures
  - c) Meet with Agency to present preliminary findings and establish agreement on measures to further analyze
- 3) Further Analysis and Audit Report
  - a) Further analyze measures

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- b) Develop a draft Technical Energy Audit Report
- c) Meet with Agency to present results
- d) Prepare final Technical Energy Audit Report
- 4) Performance Contract Proposal
  - a) Develop performance contract proposal
  - b) Meet with Agency to present results and negotiate final terms

### **b. Scope Guidelines and Requirements**

- 1) Energy Performance Contract Term. The Energy Performance Contract Term shall have a term no greater than 25 years and no greater than the cost-weighted average lifetime of the equipment, as legislated by This is required for Colorado state agencies and higher education institutions per C.R.S. 24-30-2001(1)(d) ). This is required for Colorado local governments per C.R.S.29-12.5-101(3)(h). Agency's goal is for a term no greater than Desired Financing Term (*12 years is typical unless major infrastructure improvements are involved*) years.
- 2) Annual Guaranteed Energy and Cost Savings. The annual guarantee is required for the entire financing term, however Agency has the option to terminate the guarantee at any time after the first three years of the contract term provided the annual guaranteed energy and cost savings were achieved each prior year. This is required for Colorado state agencies and higher education institutions per C.R.S. 24-30-2001(1)(c). This is required for Colorado local governments per C.R.S.29-12.5-101(3)(c). The guarantee is based on cost savings attributable to all energy saving measures, and must equal or exceed all project costs each year during the contract period. Annual project costs include debt service, Contractor fees, maintenance services, monitoring services, and other services.
- 3) Contractor shall reserve up to 2% of annually guaranteed savings for Agency to hire an independent third-party professional to review the ESCO's monitoring and verification reports and advise Agency of compliance in monitoring and verifying savings. *Note: Assume that this oversight would be 10% of the cost of the ESCO's m&v -- typically less than 1% of the overall project cost*
- 4) Excess Savings. Annual cost savings beyond the guaranteed minimum savings will be retained by Agency, and will not be allocated to shortfalls in other years.
- 5) Annual Savings Estimates: The utility and operational and maintenance cost savings for all measures must be estimated for each year during the contract period. This is required for Colorado state agencies and higher education institutions per C.R.S. 24-30-2001(1)(b). This is required for Colorado local governments per C.R.S.29-12.5-101(3)(b).



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- 6) *Note: Insert section from Request for Proposals (Attachment A): Performance Contract Terms & Conditions*
- 7) Allowable cost and savings factors approved for consideration. Agency will provide Contractor with sufficient guidance to develop savings estimates.
- a) Payment sources that can be negotiated:
1. Energy and water cost savings
  2. Agency material/commodity savings, including scheduled replacement of parts (only for years that these cost savings are applicable)
  3. Outside labor cost savings, including maintenance contracts
  4. Agency in-house labor costs
  5. Agency deferred maintenance cost
  6. Offset of future Agency capital cost
  7. Outside incentive funds (utility incentives, grants, etc.)
  8. Any savings related to maintenance and operation of the facilities will be limited to those that can be thoroughly documented.
- b) The following items may be negotiated:
1. Escalation rates that apply to each payment source. These are rates to be used in cash flow projections for project development purposes. *Note: Check with your local utilities to ensure reasonableness. Also note that rates could vary in different years during the contract term.*
  2. Interest rates (municipal tax-exempt rates for public institutions)
  3. Agency cash outlay (Agency's sole discretion)
- c) The following markup costs are disclosed to provide Agency with typical project costing approach for a project of similar scope and size. These rates will be used in the Technical Energy Audit and subsequent Energy Performance Contract, however, scope and size of project may change and necessitate a change in the markups provided below.

*Note: Use categories and costs as presented in the Contractor's response to the RFP, unless otherwise negotiated.*

MARKUPS		
CATEGORY OF MARKUP	MARKUP APPLICATION	% MARKUP
<i>General Type of Markup</i>		
<ul style="list-style-type: none"><li>• <i>Specific markup</i></li></ul>	<i>Clearly define what markup is applied to and how used</i>	

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• <i>Specific markup</i>		
<i>General Type of Markup</i>		
• <i>Specific markup</i>		
• <i>Specific markup</i>		

d) Fees: Identify fees that you typically use in your pricing structure:

<b>FEES</b>			
CATEGORY OF FEE	HOW DETERMINED & USED	MARKUP ON FEE (if any)	YEARS APPLIED (one-time, annual, etc)
Audit Contract	_____ cents per square foot		One-time fee (may be applied in phases)
<i>General Category</i>			
• <i>Specific fee</i>	<i>Clearly define</i>	0%	
<i>General Category</i>			
• <i>Specific fee</i>	<i>Clearly define</i>	0%	

c. **Collect data and background information from Agency** concerning facility operation and energy use for the most recent three years from the effective date of this Contract as follows.

- 1) Building square footage.
- 2) Construction data of buildings and major additions including building envelope
- 3) Utility company invoices
- 4) Occupancy and usage information
- 5) Description of all energy-consuming or energy-saving equipment used on the premises, as available.
- 6) Description of energy management procedures utilized on the premises
- 7) Description of any energy-related improvements made or currently being implemented
- 8) Description of any changes in the structure of the facility or energy-using or water-using equipment

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- 9) Description of future plans regarding building modifications or equipment modifications and replacements
- 10) Drawings, as available (may include mechanical, plumbing, electrical, building automation and temperature controls, structural, architectural, modifications and remodels)
- 11) Original construction submittals and factory data (specifications, pump curves, etc.), as available
- 12) Operating engineer logs, maintenance work orders, etc., as available
- 13) Records of maintenance expenditures on energy-using equipment, including service contracts
- 14) Prior energy audits or studies, if any

Agency agrees to work diligently to furnish Contractor, upon request, accurate and complete data and information as available. Where information is not available from Agency, Contractor will make a diligent effort to collect such information through the facility inspection, staff interviews, and utility companies.

Contractor agrees to work diligently to assess validity of information provided and to confirm or correct the information as needed.

**d. Identify potential measures**

- 1) Interview the facility manager, maintenance staff, subcontractors and occupants of each building regarding:
  - a) Facility operation, including energy management procedures
  - b) Equipment maintenance problems
  - c) Comfort problems and requirements
  - d) Equipment reliability
  - e) Projected equipment needs
  - f) Occupancy and use schedules for the facility and specific equipment.
  - g) Facility improvements – past, planned and desired
- 2) Inspect major energy-using equipment, including lighting (indoor and outdoor), heating and heat distribution systems, cooling systems and related equipment, automatic temperature control systems and equipment, air distribution systems and equipment, outdoor ventilation systems and equipment; exhaust systems and equipment; hot water systems, electric motors, transmission and drive systems, special systems (kitchen/dining equipment, etc.), renewable energy systems, other energy using systems, water consuming systems (restroom fixtures, water fountains, irrigation systems, etc.)
- 3) Perform "late-night" surveys outside of normal business hours or on weekends to confirm building system and occupancy schedules, if deemed necessary.
- 4) Develop a preliminary list of potential energy and water saving measures. Consider the following for each system:
  - a) Comfort and maintenance problems

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- b) Energy use, loads, proper sizing, efficiencies and hours of operation
- c) Current operating condition
- d) Remaining useful life
- e) Feasibility of system replacement
- f) Hazardous materials and other environmental concerns
- g) Agency's future plans for equipment replacement or building renovations
- h) Facility operation and maintenance procedures that could be affected
- i) Capability to monitor energy performance and verify savings

Agency will allow Contractor reasonable access to facility staff to ensure understanding of existing systems and opportunities.

Contractor agrees to work diligently to assess validity of information provided and to confirm or correct the information as needed.

e. **Establish base year consumption and reconcile with end use consumption estimates.**

- 1) Establish base year consumption by examining utility bills for the past three years for electricity, gas, steam, water, etc. Present base year consumption in terms of energy units (kWh, kW, ccf, Therms, gallons, or other units used in bills), in terms of dollars, and in terms of dollars per square foot. Describe the process used to determine the base year (averaging, selecting most representative contiguous 12 months, etc.). Consult with facility personnel to account for any anomalous schedule or operating conditions on billings that could skew the base year representation. Contractor will account for periods of time when equipment was broken or malfunctioning in calculating the base year.
- 2) Estimate loading, usage and/or hours of operation for all major end uses of total facility consumption including, but not limited to: lighting, heating, cooling, HVAC motors (fans and pumps), plug loads, and other major energy and water using equipment. Where loading or usage are highly uncertain (including variable loads such as cooling), Contractor will use its best judgment, spot measurements or short-term monitoring. Contractor should not assume that equipment run hours equal the operating hours of the building(s) or facility staff estimates.
- 3) Reconcile annual end-use estimated consumption with the annual base year consumption. This reconciliation will place reasonable "real-world" limits on potential savings.
- 4) Propose adjustments to the baseline for energy and water saving measures that will be implemented in the future.

f. **Develop a preliminary analysis of potential energy and water saving measures.**

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This list shall be compiled and submitted to **Agency** within **90** calendar days of the execution of this Contract.

- 1) List all potential opportunities, whether cost-effective or not. Consider technologies in a comprehensive approach including, but not limited to: lighting systems, heating/ventilating/air conditioning equipment and distribution systems, controls systems, building envelope, motors, kitchen equipment, pools, renewable energy systems, other special equipment, irrigation systems, and water saving devices.
  - 2) Identify measures which appear likely to be cost effective and therefore warrant detailed analysis
  - 3) For each measure, prepare a preliminary estimate of energy or water cost savings including description of analysis methodology, supporting calculations and assumptions used to estimate savings.
- g. **Meet with **Agency** to present preliminary findings** prior to thorough analysis. Describe how the projected project economics meet the **Agency's** terms for completing the Technical Energy Audit and Proposal Contract. Discuss assessment of energy use, savings potential, project opportunities, and potential for developing an energy performance contract. Develop a list of recommended measures for further analysis. The **Agency's** rejection of calculations of savings, potential savings allowed, or project recommendations shall be at the risk of the Contractor.
- h. **Analyze savings and costs for each energy and water saving measure.**
- 1) Follow the methodology of ASHRAE or other nationally-recognized authority following the engineering principle(s) identified for each retrofit option
  - 2) Utilize assumptions, projections and baselines which best represent the true value of future energy or operational savings. Include accurate marginal costs for each unit of savings at the time the audit is performed, documentation of material and labor cost savings, adjustments to the baseline to reflect current conditions at the facility, calculations which account for the interactive effects of the recommended measures.
  - 3) Use best judgment regarding the employment of instrumentation and recording durations so as to achieve an accurate and faithful characterization of energy use
  - 4) Use markups and fees stated above in all cost estimates.
  - 5) Develop a preliminary measurement and verification plan for each measure
  - 6) Follow additional guidelines for analysis and report preparation given below
  - 7) Include cost to provide services and complete application for Energy Star Label, LEED-EB certification for Existing Buildings, or other certification. Also include cost for EPA's Tools for Schools or other such program related to improved air quality.
- i. **Prepare a draft Technical Energy Audit Report.** The report provides an engineering and economic basis for negotiating a potential Energy Performance

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Contract between the Agency and the Contractor. The report shall be completed within **90** calendar days of the date of execution of this Contract. The report shall include:

- 1) Overview
  - a) Contact information
  - b) Summary table of recommended energy and water saving measures, with itemization for each measure of total design and construction cost, annual maintenance costs, the first year cost avoidance (in dollars and energy units), simple payback and equipment service life
  - c) Summary of annual energy and water use by fuel type and costs of existing or base year condition
  - d) Calculation of cost savings expected if all recommended measures are implemented, and total percentage savings of total facility energy cost.
  - e) Description of the existing facility, mechanical and electrical systems
  - f) Summary description of measures, including estimated costs and savings for each as detailed above
  - g) Discussion of measures considered but not investigated in detail
  - h) Conclusions and recommendations
- 2) Base year energy use
  - a) Description and itemization of current billing rates, including schedules and riders.
  - b) Summary of all utility bills for all fuel types and water
  - c) Identification and definition of base year consumption and description of how established
  - d) Reconciliation of estimated end use consumption (i.e. lighting, cooling, heating, fans, plug loads, etc) with with base year (include discussion of any unusual findings)
- 3) Full description of each energy and water saving measure including:
  - a) Written description
    - (1) Existing conditions
    - (2) Description of equipment to be installed and how it will function
    - (3) Include discussion of facility operations and maintenance procedures that will be affected by installation/implementation.
    - (4) Present the plan for installing or implementing the recommendation.
  - b) Savings calculations
    - (1) Base year energy use and cost
    - (2) Post-retrofit energy use and cost
    - (3) Savings estimates including analysis methodology, supporting calculations and assumptions used.
    - (4) Annual savings estimates. The cost savings for all energy saving measures must be estimated for each year during the contract period. Savings must be able to be achieved each year (cannot report average annual savings over the term of the contract).

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- (5) Savings estimates must be limited to savings allowed by the Agency as described above.
  - (6) Percent cost-avoidance projected
  - (7) Description and calculations for any proposed rate changes
  - (8) Explanation of how savings interactions between retrofit options is accounted for in calculations.
  - (9) Operation and maintenance savings, including detailed calculations and description. Ensure that maintenance savings are only applied in the applicable years and only during the lifetime of the particular equipment.
  - (10) If computer simulation is used, include a short description and state key input data. If requested by Agency, access will be provided to the program and all assumptions and inputs used, and/or printouts shall be provided of all input files and important output files and included in the Technical Energy Audit with documentation that explains how the final savings figures are derived from the simulation program output printouts
  - (11) If manual calculations are employed, formulas, assumptions and key data shall be stated.
  - (12) Conclusions, observations, caveats
- c) Cost estimate -- detailed scope of the construction work needed, suitable for cost estimating. Include all anticipated costs associated with installation and implementation. Provide specifications for major mechanical components as well as detailed lighting and water fixture counts. This is required for Colorado state agencies and higher education institutions per C.R.S. 24-30-2002(3). This is required for Colorado local governments per C.R.S.29-12.5-102(2).
- (1) Engineering/design costs
  - (2) Contractor/vendor estimates for labor, materials, and equipment; include special provisions, overtime, etc., as needed to accomplish the work with minimum disruption to the operations of the facilities.
  - (3) Permit costs
  - (4) Construction management fees
  - (5) Environmental costs or benefits (disposal, avoided emissions, handling of hazardous materials, etc.)
  - (6) Note that all markups and fees stated in this Contract shall be used in the cost estimates, unless otherwise documented and justified due to change in scope or size of project or other unforeseen circumstances.
  - (7) Conclusions, observations, caveats
  - (8) Other cost categories as defined above under “markups” in Section 3b above.



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d) Other

- (1) Estimate of average useful service life of equipment
- (2) Preliminary commissioning plan
- (3) Preliminary measurement and verification plan, following the International Performance Measurement and Verification Protocol (IPMVP), explaining how savings from each measure is to be measured and verified (stipulated by Contract, utility bill analysis, end-use measurement and calculation, etc.). The Preliminary M&V plan shall follow the format provided in **Exhibit C: Guidelines for Draft Monitoring and Verification Plan.**
- (4) Discussion of impacts that facility would incur after contract ends. Consider operation and maintenance impacts, staffing impacts, budget impacts, etc., and identify who is responsible for maintenance.
- (5) Compatibility with existing systems. *Note: Could include name of existing controls system, if new controls systems will have to be compatible with an existing brand of controls.*
- (6) Complete appendices that document the data used to prepare the analyses. Describe how data were collected.

j. **Meet with Agency** to:

Review the recommendations, savings calculations and impact of the measures on the operations of the facility. Describe how the projected project economics meet the Agency's terms for completing the Technical Energy Audit and Performance Contract Proposal. Discuss the willingness and capability of Agency to make capital contributions to the project to improve the economics of the overall project.

k. **Revise Audit as directed by Agency.**

1. **Prepare a Performance Contract Proposal (Term Sheet).** In anticipation of Contractor and Agency entering into an Energy Performance Contract to design, install, and monitor the energy and water saving measures proposed in the Technical Energy Audit Report, Contractor shall prepare a proposal for terms to be incorporated in a Energy Performance contract to include:

- 1) Project Cost is the total amount Agency will pay for the project and Contractor's services. Costs must be consistent with maximum markups and fees established above. Costs may include but are not limited to: engineering, designing, packaging, procuring, installing (from Technical Energy Audit Report results); performance/payment bond costs; construction management fees; commissioning costs; maintenance fees; monitoring fees; training fees; legal services; overhead and profit; other markups.
- 2) Include a List of Services that will be provided as related to each cost.



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- 3) Expected term of the Energy Performance Contract.
- 4) Description of how the project will be financed including available interest rates and financing terms, based on interest rates likely available to Agency at this time, and based on a 60-day and 90-day lock option.
- 5) Explanation of how the savings will be calculated and adjusted due to weather (such as heating and cooling degree days), occupancy or other factors. Monitoring and verification methods must be consistent with the International Performance Monitoring and Verification Protocol 2000.
- 6) Analysis of annual cash flow for Agency during the contract term.

### **4. Termination**

CONTRACTOR may terminate this Contract at any time as described below by:

#### **a. Termination for Default/Cause**

##### **1) Default**

If the Contractor refuses or fails to timely perform any of the provisions of this contract, with such diligence as will ensure its completion within the time specified in this contract, the procurement officer may notify the Contractor in writing of the non-performance, and if not promptly corrected within the time specified, such officer may terminate the Contractor's right to proceed with the contract or such part of the contract as to which there has been delay or a failure to properly perform. The Contractor shall continue performance of the contract to the extent it is not terminated and shall be liable for excess costs incurred in procuring similar goods or services elsewhere.

##### **2) Contractor's Duties**

Notwithstanding termination of the contract and subject to any directions from the procurement officer, the Contractor shall take timely, reasonable and necessary action to protect and preserve property in the possession of the Contractor in which the purchasing agency has an interest.

##### **3) Compensation**

Payment for completed supplies delivered and accepted by the purchasing agency shall be at the contract price. The purchasing agency may withhold amounts due to the Contractor as the procurement officer deems to be necessary to protect the purchasing agency against loss because of outstanding liens or claims of former lien holders and to reimburse the purchasing agency for the excess costs incurred in procuring similar goods and services.

##### **4) Excuse for Nonperformance or Delayed Performance**

The Contractor shall not be in default by reason of any failure in performance of this contract in accordance with its terms if such failure arises out of acts of God; acts of the public enemy; acts of the State and any governmental entity in its sovereign or contractual capacity; fires; floods; epidemics; quarantine restrictions; strikes or other labor disputes; freight embargoes; or unusually severe weather. Upon request of the Contractor, the procurement officer shall ascertain the facts and extent of such failure, and, if such officer determines that any failure to

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perform was occasioned by any one or more of the excusable causes, and that, but for the excusable cause, the Contractor's progress and performance would have met the terms of the contract, the delivery schedule shall be revised accordingly, subject to the rights of the purchasing agency.

**5) Erroneous Termination for Default**

If after notice of termination of the Contractor's right to proceed under the provisions of this clause, it is determined for any reason that the Contractor was not in default under the provisions of this clause, or that the delay was excusable, the rights and obligations of the parties shall be the same as if the notice of termination had been issued pursuant to the termination for convenience clause.

**b. Termination for Convenience**

**1) Termination**

The Agency may, when the interests of the purchasing agency so require, terminate this contract in whole or in part, for the convenience of the agency. The Agency shall give written notice of the termination to the Contractor specifying the part of the contract terminated and when termination becomes effective. This in no way implies that the purchasing agency has breached the contract by exercise of the Termination for Convenience Clause.

**2) Contractor's Obligations**

The Contractor shall incur no further obligations in connection with the terminated work and on the date set in the notice of termination the Contractor will stop work to the extent specified. The Contractor shall also terminate outstanding orders and subcontracts as they relate to the terminated work. The Contractor shall settle the liabilities and claims arising out of the termination of subcontracts and orders connected with the terminated work. The Agency may direct the Contractor to assign the Contractor's right, title, and interest under terminated orders or subcontracts to the purchasing agency. The Contractor must still complete and deliver to the purchasing agency the work not terminated by the Notice of Termination and may incur obligations as are necessary to do so.

**3) Compensation**

- a) The Contractor shall submit a termination claim specifying the amounts due because of the termination for convenience together with cost or pricing data bearing on such claim. If the Contractor fails to file a termination claim within 90 days from the effective date of termination, the Agency may pay the Contractor, if at all, an amount set in accordance with subparagraph C of this Section.
- b) The Agency and the Contractor may agree to a settlement provided the Contractor has filed a termination claim supported by cost or pricing data and that the settlement does not exceed the total contract price plus settlement costs, reduced by payments previously made by the purchasing agency, the proceeds of any sales of supplies and manufactured materials made under agreement, and the contract price of the work not terminated.
- c) Absent complete agreement, under subparagraph B of this Section, the Agency shall pay the Contractor the following amounts, provided the

## **Contract for Technical Energy Audit & Performance Contract Proposal**

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payments agreed to under subparagraph B shall not duplicate payments under this subparagraph:

- (1) Contract prices for supplies or services accepted under the contract;
  - (2) Costs incurred in preparing to perform the terminated portion of the work plus a fair and reasonable profit on such portion of the work (such profit shall not include anticipatory profit or consequential damages) less amounts paid to or to be paid for accepted supplies or services; provided, however, that if it appears that the Contractor would have been sustained a loss if the entire contract would have been completed, no profit shall be allowed or included and the amount of compensation shall be reduced to reflect the anticipated rate of loss.
  - (3) Costs of settling and paying claims arising out of the termination of subcontracts or orders pursuant to the Contractor's obligations paragraph of this clause. These costs must not include costs paid in accordance with subparagraph B of this Section.
  - (4) The reasonable settlement costs of the Contractor including accounting, legal, clerical, and other expenses reasonably necessary for the preparation of settlement claims and supporting data with respect to the terminated portion of the contract and for the termination and settlement of subcontracts thereunder, together with reasonable storage, transportation, and other costs incurred in connection with the terminated portion of this contract.
  - (5) The total sum to be paid the Contractor under this subparagraph C shall not exceed the total contract price plus settlement costs, reduced by the amount of payments otherwise made, the proceeds of any sales of supplies and manufacturing materials under subparagraph B, and the contract price of work not terminated.
- d) Cost claimed or agreed to under this section shall be in accordance with applicable sections of the Colorado State Procurement Code.

### **c. Lack of Funding**

### **d. At any time as described in Section 2.b above.**

## **5. Insurance**

***Note to Agency: Coordinate insurance requirements and amounts of coverage with existing policy amounts and coverages and modify below as needed.***

Before commencing any Work under this Contract, Contractor shall file with Agency certificates of insurance evidencing the coverage's as specified below:

- a. It is agreed and understood Contractor shall maintain in full force and effect adequate commercial general liability insurance and property damage insurance,

## **Contract for Technical Energy Audit & Performance Contract Proposal**

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- as well as workmen's compensation and employer's liability insurance pursuant to the State insurance requirements as defined below.
- b. The Contractor shall obtain, and maintain at all times during the term of this Agreement, insurance in the following kinds and amounts.
- 1) Standard Workers' Compensation and Employer's Liability as required by State statute, including occupational disease, covering all employees at the work site.
  - 2) General Liability (minimum coverage)
    - a) Combined single limit of \$600,000 written on an occurrence basis.
    - b) Any aggregate limit will not be less than \$1,000,000.
    - c) The Contractor must purchase additional insurance if claims reduce the annual aggregate below \$600,000.
  - 3) Automobile Liability (minimum coverage) in the amount of \$600,000 combined single limit
  - 4) The Agency shall be named as an additional insured on each commercial general liability policy.
  - 5) The insurance shall include provisions preventing cancellation without 30 calendar days prior written notice, by certified mail to the Principal Representative
  - 6) Contractor shall be responsible for all claims, damages, losses or expenses, including attorney's fees, arising out of or resulting from the performance of the Services contemplated in this Contract, provided that any such claim, damage, loss or expense is caused by any neglect act, error or omission of Contractor, any Consultant or associate thereof, or anyone directly or indirectly employed by Contractor. Contractor shall submit a Certificate of Insurance at the signing of this Contract and also any notices of Renewal of said Policy as they occur.
- 6. Energy Performance Contract**
- The Parties intend to negotiate an Energy Performance Contract under which the Contractor will design, install and implement energy and water saving measures which the Parties have agreed to, and provide certain maintenance and monitoring services. However, nothing in this Contract should be construed as an obligation on any of the Parties to execute such a contract. The terms and provisions of such an Energy Performance Contract will be set forth in a separate contract.
- 7. Extent of Agreement**
- a. This Contract represents the entire and integrated agreement between Agency and Contractor and supersedes all prior negotiations, representations or agreement, either written or oral. This Contract may be amended only by written instrument signed by the Agency *Note: For state agencies, insert "State of Colorado, name of department, the Manager of State Buildings and Real Estate Programs or delegate, the Attorney General or delegate and the State Controller or delegate".*

## Contract for Technical Energy Audit & Performance Contract Proposal

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- b. The Agency and Contractor understand and agree the attachment and exhibits hereto are and shall be an integral part of this Contract and the terms and provisions thereof are hereby incorporated, made a part of and shall supplement those recited herein. In the event of any conflict, or variance, the terms and provisions of this printed Agreement shall supersede, govern and control
- 8. Term**  
The term of this Contract will become effective upon approval by the Controller and acceptance by the Principal Representative. The term shall end number of days plus 15 days to allow for processing of check (suggest 135 days) after signing of the **Notice of Acceptance (Exhibit B)** of the Final Technical Energy Audit Report by the Principal Representative.
- 9. Order of Precedence**  
In the event of conflict or inconsistency between this contract and its exhibits or attachments, such conflicts or inconsistencies shall be resolved by reference to the documents in the following order of priority:
1. Colorado Special Provisions *These Special Provisions are required for State of Colorado agency/institution projects.*
  2. Contract - general terms and conditions
  3. Other exhibits or attachments

**10. Colorado Special Provisions**

*These provisions are required for State of Colorado agencies and higher education institutions*

### **STATE OF COLORADO SPECIAL PROVISIONS**

**1. CONTROLLER'S APPROVAL. CRS 24-30-202 (1)**

*This contract shall not be deemed valid until it has been approved by the Controller of the State of Colorado or such assistant as he may designate.*

**2. FUND AVAILABILITY. CRS 24-30-202 (5.5)**

*Financial obligations of the State of Colorado payable after the current fiscal year are contingent upon funds for that purpose being appropriated, budgeted, and otherwise made available.*

**3. INDEMNIFICATION.**

*The Contractor shall indemnify, save, and hold harmless the State, its employees and agents, against any and all claims, damages, liability and court awards including costs, expenses, and attorney fees incurred as a result of any act or omission by the Contractor, or its employees, agents, subContractors, or assignees pursuant to the terms of this contract.*

## Contract for Technical Energy Audit & Performance Contract Proposal

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### 4. *INDEPENDENT Contractor. 4 CCR 801-2*

*THE CONTRACTOR SHALL PERFORM ITS DUTIES HEREUNDER AS AN INDEPENDENT CONTRACTOR AND NOT AS AN EMPLOYEE. NEITHER THE CONTRACTOR NOR ANY AGENT OR EMPLOYEE OF THE CONTRACTOR SHALL BE OR SHALL BE DEEMED TO BE AN AGENT OR EMPLOYEE OF THE STATE. CONTRACTOR SHALL PAY WHEN DUE ALL REQUIRED EMPLOYMENT TAXES AND INCOME TAX AND LOCAL HEAD TAX ON ANY MONIES PAID BY THE STATE PURSUANT TO THIS CONTRACT. CONTRACTOR ACKNOWLEDGES THAT THE CONTRACTOR AND ITS EMPLOYEES ARE NOT ENTITLED TO UNEMPLOYMENT INSURANCE BENEFITS UNLESS THE CONTRACTOR OR THIRD PARTY PROVIDES SUCH COVERAGE AND THAT THE STATE DOES NOT PAY FOR OR OTHERWISE PROVIDE SUCH COVERAGE. CONTRACTOR SHALL HAVE NO AUTHORIZATION, EXPRESS OR IMPLIED, TO BIND THE STATE TO ANY AGREEMENTS, LIABILITY, OR UNDERSTANDING EXCEPT AS EXPRESSLY SET FORTH HEREIN. CONTRACTOR SHALL PROVIDE AND KEEP IN FORCE WORKERS' COMPENSATION (AND PROVIDE PROOF OF SUCH INSURANCE WHEN REQUESTED BY THE STATE) AND UNEMPLOYMENT COMPENSATION INSURANCE IN THE AMOUNTS REQUIRED BY LAW, AND SHALL BE SOLELY RESPONSIBLE FOR THE ACTS OF THE CONTRACTOR, ITS EMPLOYEES AND AGENTS.*

### 5. *NON-DISCRIMINATION.*

*The Contractor agrees to comply with the letter and the spirit of all applicable state and federal laws respecting discrimination and unfair employment practices.*

### 6. *CHOICE OF LAW.*

*The laws of the State of Colorado and rules and regulations issued pursuant thereto shall be applied in the interpretation, execution, and enforcement of this contract. Any provision of this contract, whether or not incorporated herein by reference, which provides for arbitration by any extra-judicial body or person or which is otherwise in conflict with said laws, rules, and regulations shall be considered null and void. Nothing contained in any provision incorporated herein by reference which purports to negate this or any other special provision in whole or in part shall be valid or enforceable or available in any action at law whether by way of complaint, defense, or otherwise. Any provision rendered null and void by the operation of this provision will not invalidate the remainder of this contract to the extent that the contract is capable of execution.*

*At all times during the performance of this contract, the Contractor shall strictly adhere to all applicable federal and State laws, rules, and regulations that have been or may hereafter be established.*

### 7. *VENDOR OFFSET. CRS 24-30-202 (1) & CRS 24-30-202.4*

*Pursuant to CRS 24-30-202.4 (as amended), the State Controller may withhold debts owed to State agencies under the vendor offset intercept system for: (a) unpaid child support debt or child support arrearages; (b) unpaid balance of tax, accrued interest,*

## **Contract for Technical Energy Audit & Performance Contract Proposal**

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*or other charges specified in Article 21, Title 39, CRS; (c) unpaid loans due to the Student Loan Division of the Department of Higher Education; (d) owed amounts required to be paid to the Unemployment Compensation Fund; and (e) other unpaid debts owing to the State or any agency thereof, the amount of which is found to be owing as a result of final agency determination or reduced to judgment as certified by the controller.*

8. **EMPLOYEE FINANCIAL INTEREST. CRS 24-18-201 & CRS 24-50-507**

*The signatories aver that to their knowledge, no employee of the State of Colorado has any personal or beneficial interest whatsoever in the service or property described herein.*



## **Contract for Technical Energy Audit & Performance Contract Proposal**

### **THE PARTIES HERETO HAVE EXECUTED THIS CONTRACT**

IN WITNESS WHEREOF, and intending to be legally bound, the parties hereto subscribe their names to this Contract on the date first written above.

STATE OF COLORADO, acting by and through:  
Department of Personnel and Administration

By \_\_\_\_\_  
Principal Representative

(Corporate Seal)

CONTRACTOR  
By:

ATTEST \_\_\_\_\_ Name  
Title

\_\_\_\_\_  
Secretary Signature

\_\_\_\_\_  
Address

\_\_\_\_\_  
City, State, Zip

\_\_\_\_\_  
Social Security Number or Federal ID Number

**APPROVED:**  
**STATE OF COLORADO**  
**DEPARTMENT OF LAW**  
**ADMINISTRATION**  
\_\_\_\_\_, Attorney General

(or authorized Delegate)  
Delegate)

By: \_\_\_\_\_

**APPROVED:**  
**STATE OF COLORADO**  
**DEPARTMENT OF PERSONNEL &**  
**STATE BUILDINGS AND REAL ESTATE**  
Larry Friedberg, Manager (or authorized

By: \_\_\_\_\_

### **ALL CONTRACTS MUST BE APPROVED BY THE STATE** **CONTROLLER**

CRS 24-30-202 requires that the State Controller approve all state contracts. This contract is not valid until the State Controller, or such assistant as he may delegate, has signed it. The Contractor is not authorized to begin performance until the contract is signed and dated below. If performance begins prior to the date below, the State of Colorado may not be obligated to pay for the goods

Agency Name



## **Contract for Technical Energy Audit & Performance Contract Proposal**

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and/or services provided.

**STATE CONTROLLER:**

\_\_\_\_\_

**By** \_\_\_\_\_

**Date** \_\_\_\_\_

**EXHIBIT A**

**Minority/Women Business Enterprise Participation Report**

## Contract for Technical Energy Audit & Performance Contract Proposal

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### EXHIBIT B

#### Notice of Acceptance of Technical Energy Audit Report

For state agencies and higher education institutions, use first page and delete second page.

For others, delete first page and use second page.



### State of Colorado

Notice of Acceptance

Date of Notice \_\_\_\_\_

Notice is hereby given that *Customer* accepts the Technical Energy Audit and Project Development Proposal by Contractor, as contemplated in **Section 2 of the Contract for Technical Energy Audit and Project Development** dated \_\_\_\_\_.

Department of Personnel & Administration  
State Buildings & Real Estate Programs

*Customer Name*

By \_\_\_\_\_

By \_\_\_\_\_

Date

Date

When completely executed, this form is to be sent by certified mail to the Contractor by *Customer*.

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Agency Name

## Contract for Technical Energy Audit & Performance Contract Proposal

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For non-state projects only:

Notice of Acceptance

Date of Notice \_\_\_\_\_

Notice is hereby given that **Agency** accepts the Technical Energy Audit and Project Development Proposal by Contractor, as contemplated in **Section 2 of the Technical Energy Audit and Project Proposal Contract** dated \_\_\_\_\_.

Agency Name

By \_\_\_\_\_

Date

When completely executed, this form is to be sent by certified mail to the Contractor by Agency Name.

**EXHIBIT C**

**Guidelines for Draft Monitoring and Verification Plan**

# **Measurement & Verification for Performance Contracts Through Rebuild Colorado**

**January 2005**

**Rebuild Colorado**



A Program of the Governor's Office of Energy Management and  
Conservation

225 East 16th Avenue Suite 650

Denver, CO 80203

[rebuildco@state.co.us](mailto:rebuildco@state.co.us) [www.colorado.gov/rebuildco](http://www.colorado.gov/rebuildco)

### **Why Measure and Verify?**

Energy performance contracts are based on “guaranteed savings.” Any authentic guarantee of energy and cost savings includes adequate measurement and verification (M&V) activities. For Colorado state agencies, a savings guarantee is required for at least the first three years of a performance contract<sup>1</sup>. For Colorado local governments, the savings guarantee is required for at least the first two years<sup>2</sup>.

There are many reasons to use measurement & verification strategies that go far beyond satisfying the law. Properly applied, measurement & verification can:

- . • Accurately assess energy savings for a project;
- . • Allocate risks to the appropriate parties;
- . • Reduce uncertainties to reasonable levels;
- . • Ensure that the agency achieves utility budget savings;
- . • Monitor equipment performance;
- . • Find additional savings;
- . • Improve operations & maintenance;
- . • Verify savings guarantee is met;
- . • Allow for future adjustments, as needed.

### **Energy Savings Depend on Performance and Usage**

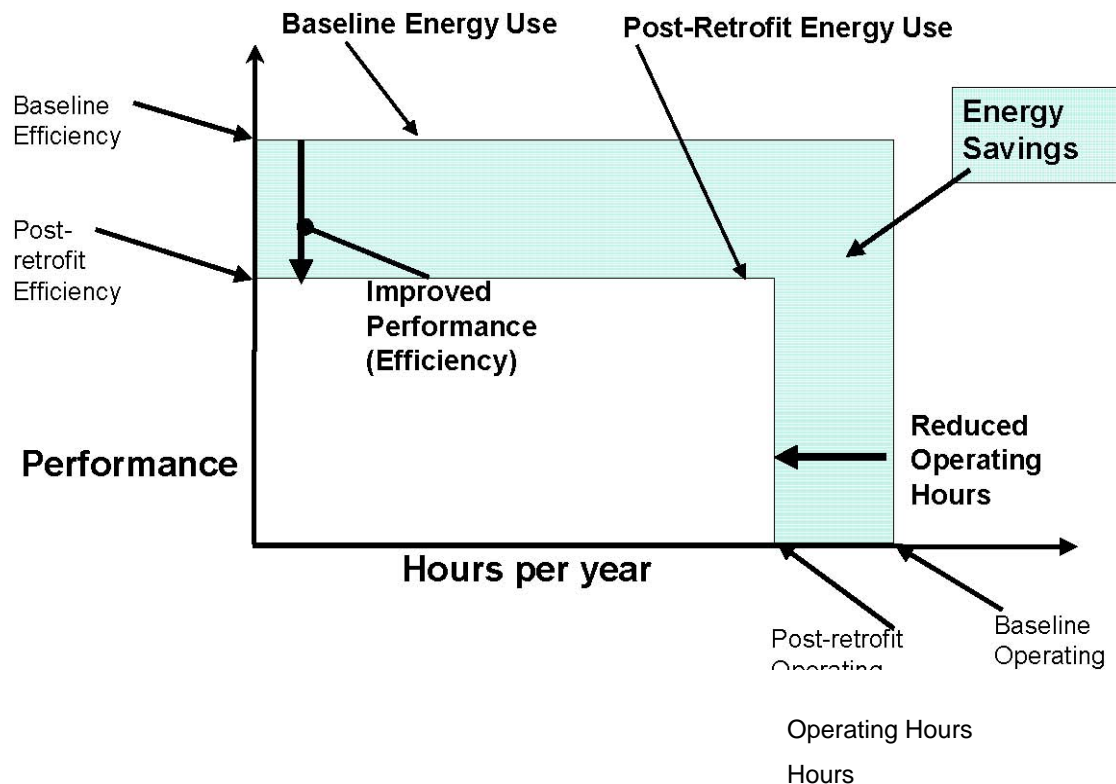
There are two fundamental factors that drive energy savings: performance and usage. Performance describes the amount of energy used to accomplish a specific task, and may also be referenced as efficiency or rate of energy use. Usage describes the operating hours, or total time, that a piece of equipment runs.

The energy consumption is generally determined by multiplying performance (or efficiency) by usage (or operating hours). In all cases, both performance and usage factors need to be known to determine energy consumption and savings, as shown in Figure 1.

Savings are determined by comparing the energy use of the pre-retrofit case, called the *baseline*, with the post-retrofit energy use. This means that the performance and usage factors must be known for both the baseline and post-retrofit cases in order to determine energy savings.

<sup>1</sup> Per Colorado statute CRS 24-30-2001

<sup>2</sup> Per Colorado statute CRS 29-12.5-2000



**Figure 1: Energy Savings Depend on Performance and Usage**

Both performance and usage factors need to be known to determine energy consumption and savings, as shown in Figure 1. Lighting provides a simple example: performance would be the watts required to provide a specific amount of light; usage would be the operating hours per year. Lighting energy used is equal to watts \* operating hours.

A chiller is a more complex system: performance is defined as kW/ton, which varies with load; usage is defined by cooling load profile and ton-hours. Chiller energy must be analyzed on an hourly basis because equipment efficiency varies with loading, and is equal to  $\text{Sum} [\text{kW/ton} * \text{ton/hours}]$ .

## **Using M&V To Allocate Risk**

One of the primary purposes of M&V is to reduce risk to an acceptable level, which is a subjective judgment based on the agency's priorities and preferences. In performance contracts, risks are allocated between the ESCO and the owner. Allocation of risk is accomplished through carefully crafted M&V strategies.

“Risk” in the M&V context refers to the uncertainty that expected savings will be realized. Assumption of risk implies acceptance of the potential monetary consequences. Both ESCOs and agencies are reluctant to assume responsibility for factors they cannot

control, and stipulating certain parameters in the M&V plan can assign responsibility to each party for the parameters they are best able to control. For example, usage factors under the agency's control such as lighting operating hours and thermostat setpoints are typically stipulated. Using stipulations means that the ESCO and agency agree to use a set value for a parameter throughout the term of the contract, regardless of the actual behavior of that parameter.

If no stipulated values are used and savings are verified based entirely on measurements, then more of the risk resides with the ESCO, who must show that the guaranteed savings are realized, or prove how contributing factors effected the result. Alternatively, the agency assumes the risk for the parameters that are stipulated. In the event that the stipulated values overstate the savings, the agency will not be able to claim the actual shortfall from the ESCO's guarantee. If the actual savings are greater than expected due to underestimated stipulated values, the agency benefits from the surplus savings.

Risk related to usage stems from uncertainty in operational factors. For example, savings fluctuate depending on weather, how many hours equipment is used, user intervention, or maintenance practices. Since ESCOs often have no control over such factors, they are usually reluctant to assume usage risk. The agency generally assumes responsibility for usage risk by either allowing baseline adjustments based on measurements, or by agreeing to stipulated equipment operating hours or other usage-related factors.

Performance risk is the uncertainty associated with characterizing a specified level of equipment performance. The ESCO is ultimately responsible for selection, application, design, installation, and performance of the equipment and typically assumes responsibility for achieving savings related to equipment performance. To validate performance, the ESCO must demonstrate that the equipment is operating as intended and has the potential to deliver the guaranteed savings.

Using stipulations in savings estimates can be a practical, cost-effective way to minimize M&V costs and allocate risks. Stipulations used appropriately do not jeopardize the savings guarantee, the agency's ability to pay for the project, or the value of the project to the government. However, stipulations shift risk to the agency, and the agency should thoroughly understand the potential consequences before accepting them. Risk is minimized through carefully crafted M&V requirements including diligent estimation of the stipulated values.

### **Primary Steps To Verify Savings**

Regardless of the M&V strategy used, similar steps are taken to verify the potential for the installed energy conservation measures (ECMs) to generate savings. Verifying the potential to generate savings can also be stated as confirming that:

Step 1: The baseline conditions were accurately defined,



## **Contract for Technical Energy Audit & Performance Contract Proposal**

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- Step 2: A suitable project specific M&V plan was developed,
- Step 3: Proper equipment/systems were installed and are performing to specification, and
- Step 4: The equipment/systems continue to have the potential to generate the predicted savings.

These 4 steps are discussed in detail below.

### **Step 1: Define The Baseline**

Typically the ESCO defines the baseline as part of a Technical Energy Audit. Baseline physical conditions (such as equipment inventory and conditions, occupancy, nameplate data, energy consumption rate, control strategies, and so on) are typically determined through surveys, inspections, spot measurements, and short-term metering activities. Baseline conditions are established for the purpose of calculating savings by comparing the baseline energy use to the post-installation energy use. Baseline data are used to account for any changes that may occur during the performance period, which may require baseline energy use adjustments. It is the agency's responsibility to ensure the baseline has been properly defined.

In almost all cases after the measure has been installed, one cannot go back and re-evaluate the baseline. It no longer exists! Therefore, it is very important to properly define and document the baseline conditions. Deciding what needs to be monitored, and for how long, depends on factors such as the complexity of the measure and the stability of the baseline, including the variability of equipment loads and operating hours, and the number of variables that affect the load.

### **Step 2: Develop Project Specific Measurement & Verification Plan**

The project specific M&V plan is developed during contract negotiations. The M&V plan is the single most important item in an energy savings "guarantee."

The project specific M&V plan includes project-wide items as well as details for each ECM, including:

- . • Details of baseline conditions and data collected
- . • Documentation of all assumptions and sources of data
- . • What will be verified
- . • Who will conduct the M&V activities
- . • Schedule for all M&V activities
- . • Discussion on risk and savings uncertainty
- . • Details of engineering analysis performed
- . • Detail baseline energy and water rates.
- . • Provide performance period adjustment factors for energy, water, and O&M rates, if used<sup>3</sup>.

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- . • How energy and cost savings will be calculated
- . • Detail any operations & maintenance (O&M) cost savings claimed
- . • Define O&M reporting responsibilities
- . • Define content and format of all M&V reports (Post-Installation Commissioning and M&V, Annual or periodic)
- . • How & why the baseline may be adjusted
- . • Define preventive maintenance responsibilities

<sup>3</sup> Use NIST data to determine maximum allowable utility escalation factor. See Energy Escalation Rate Calculator (EERC 1.0-04) at [http://www.eere.energy.gov/femp/information/download\\_blcc.cfm](http://www.eere.energy.gov/femp/information/download_blcc.cfm). Although the M&V plan is usually developed during contract negotiations, it is important that the agency and the ESCO agree upon general M&V approaches to be used prior to starting the Technical Energy Audit. The M&V method(s) chosen can have a dramatic affect on how the baseline is defined, determining what activities are conducted during the audit.

It is strongly recommended that the format of M&V plan included in the Technical Energy Audit follows the Annual Report Outline<sup>4</sup> developed by FEMP.

### **Step 3: Post-Installation Verification**

Post-installation verification is conducted by both the ESCO and the agency to ensure that proper equipment/systems were installed, are operating correctly, and have the potential to generate the predicted savings. The verification is accomplished through commissioning and M&V activities.

Commissioning of installed equipment and systems should be required. Commissioning ensures that systems are designed, installed, functionally tested in all modes of operation, and capable of being operated and maintained in conformity with the design intent regardless of energy impact. Commissioning is generally completed by the ESCO and witnessed by the agency. In some cases, however, it is contracted out to a third party.

After system start-up and commissioning activities are completed, the acceptance testing (M&V) activities specified in the contract are implemented. Verification methods may include surveys, inspections, spot measurements, and short-term metering.

The results of the commissioning and M&V activities are usually presented in reports delivered by the ESCO prior to final project acceptance, as discussed below.

### **Post-Installation and Commissioning Reports**

The results of the installation verification activities are presented in a Post-Installation Report delivered by the ESCO to the agency prior to final project acceptance. This report also documents any changes in the contracted project scope and energy savings based on the actual installed conditions. The commissioning report details the commissioning

activities conducted to assure equipment was properly installed and is operating to specification.

For projects using any stipulated values<sup>5</sup> to calculate energy savings, the post-installation verification is the most important M&V step since any measurements to substantiate the savings

<sup>4</sup> FEMP M&V Outlines are available through [http://www.eere.energy.gov/femp/financing/superespcs\\_mvresources.cfm](http://www.eere.energy.gov/femp/financing/superespcs_mvresources.cfm).

<sup>5</sup> Using stipulations means that the ESCO and agency agree to use a set value for a parameter throughout the term of the contract, regardless of the actual behavior of that parameter. guarantee are made only once. Thereafter, inspections may be conducted to verify that the ‘potential to perform’ exists.

The Post-Installation Report includes:

- . • Project description
- . • Installation verification – list of installed equipment
- . • Details of any changes between Contract and as-built conditions, including energy impacts
- . • Documentation of all post-install verification activities and performance measurements conducted
- . • Performance verification – how performance criteria were met
- . • Expected savings for the first year

The Commissioning Report includes:

- Commissioning results and documentation

It is strongly recommended that the format of the Post-Installation Report follows the Post-Installation Report Outline<sup>6</sup> developed by FEMP.

### Step 4: Periodic Performance Period Verification

For at least the first two or three years<sup>7</sup> after installation, the ESCO is required to submit an annual report documenting the savings actually achieved. Inspections should confirm that the installed equipment/systems have been properly maintained, continue to operate correctly, and continue to have the potential to generate the predicted savings. In many cases, equipment performance measurements should be used to substantiate savings.

Sometimes, more frequent verification activities can be appropriate. This ensures that the M&V monitoring and reporting systems are working properly, it allows fine-tuning of measures throughout the year based on operational feedback, and it avoids surprises at the end of the year.

At the agency’s option, the savings guarantee can be extended beyond the legislatively required 2 to 3 years. For more complex projects, ongoing M&V activities can help

## Contract for Technical Energy Audit & Performance Contract Proposal

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ensure the persistence of savings.

At the end of each performance year (as specified in the contract), the contractor submits an Annual Performance Report to demonstrate that the savings have occurred. For Rebuild Colorado projects, only overall savings guarantee has to be met on a cumulative basis for all ECMs. It is appropriate, however, to itemized the ‘actual’ savings for each ECM.

The Annual Performance Reports should include:

- . • Results/documentation of performance measurements and inspections
- . • Realized savings for the year (energy, energy costs, O&M costs, other)
- . • Comparison of actual savings to the guaranteed amounts
- . • Details of all analysis and savings calculations, including commodity rates used and any baseline adjustments performed

<sup>6</sup> FEMP M&V Outlines are available through [http://www.eere.energy.gov/femp/financing/superespcs\\_mvresources.cfm](http://www.eere.energy.gov/femp/financing/superespcs_mvresources.cfm).

<sup>7</sup> Colorado legislative requirement for state agencies is 3 years; requirement for local agencies is 2 years

- . • Summary of operations and maintenance activities conducted
- . • Details of any performance or O&M issues that require attention

It is strongly recommended that the format of Annual Report follows the Annual Report Outline<sup>8</sup> developed by FEMP.

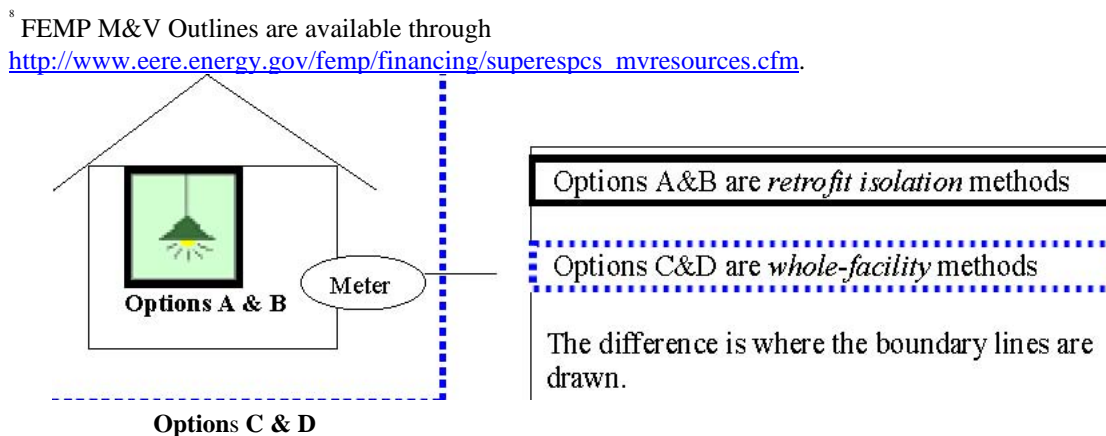
## **M&V Protocols and Methods**

Measuring and verifying savings from performance contracting projects requires special project planning and engineering activities. M&V continues to evolve with the performance contracting industry, although common practices exist. These practices are documented in several guidelines including the *International Performance Measurement & Verification Protocol* (IPMVP, 2001), *FEMP M&V Guidelines: Measurement and Verification for Federal Energy Projects* Version 2.2 (2000), and *ASHRAE Guideline 14: Measurement of Energy and Demand Savings* (2002).

Many industry professionals consider the *International Performance Measurement & Verification Protocol* (IPMVP) the standard protocol for conducting M&V on energy saving projects. IPMVP is available through <http://ipmvp.org/>.

IPMVP groups M&V methodologies into four categories: Options A, B, C, and D. The options are generic M&V approaches for energy and water saving projects. Having four options provides a range of approaches to determine energy savings depending on the characteristics of the ECMs being implemented, and balancing the accuracy in energy savings estimates with the cost of conducting M&V activities.

M&V approaches are divided into two general types: retrofit isolation and whole facility. Retrofit isolation methods look only at the affected equipment or system independent of the rest of the facility; whole facility methods consider only the total energy use while ignoring specific equipment performance. Options A and B are retrofit isolation methods; Option C is a whole facility method. Option D can be used as either, but is usually applied as a whole facility method. The differences in these approaches are shown in Figure 2.



**Figure 2: Retrofit Isolation vs. Whole-Facility M&V Methods**

The four generic M&V options are described in more detail below. Each option has advantages and disadvantages based on site-specific factors and the needs and expectations of the agency. While each option defines a savings determination approach, all savings are estimates since savings cannot be directly measured. Generally, the accuracy of savings estimates improves as more measurements are used in defining the baseline and monitoring the post-installation conditions. The improved accuracy in savings estimates must be weighed against higher M&V costs.

### Option A – Partially Measured Retrofit Isolation

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Option A is a retrofit isolation approach designed for projects in which the potential to generate savings must be verified, but the actual savings can be determined from short-term data collection, engineering calculations, and stipulated factors. Post-installation energy use, equipment performance, and usage are NOT measured throughout the term of the contract. Post-installation and baseline energy use is estimated using an engineering analysis of information that does not involve long-term measurements.

The intent of Option A is to verify performance through pre- and post-retrofit measurements. Usage factors can be measured or stipulated based upon engineering estimates, operating schedules, operator logs, typical weather data, or other documented information source. Post-retrofit measurements are made only once. Thereafter, inspections verify that the ‘potential to perform’ exists. So long as the ‘potential to perform’ is verified, the savings are as originally claimed and do not vary over the contract term.

Option A methods are appropriate for less complex measures whose performance and operational characteristics are well understood and are unlikely to change. An Option A approach can also be suitable when the value of the measure’s cost savings are low. Examples of projects where Option A may be appropriate include one-for-one lighting replacement measures, high efficiency motors with constant loads, or measures with small percentage of overall cost savings.

Additional information on the proper application of Option A methods are discussed in *Detailed Guidelines for FEMP M&V Option A* available through <http://ateam.lbl.gov/mv/docs/OptionADetailedGuidelines.pdf>.

### **Option B – Retrofit Isolation**

Option B is a retrofit isolation or system level approach, and requires continuous measurement to provide long-term verification of the savings. This method is intended for retrofits with performance factors and operational factors that can be measured at the component or system level and where long-term performance needs to be verified. Option B is similar to Option A but uses periodic or continuous metering. Short-term periodic measurements can be used when variations in the measured factor are small. Continuous monitoring information can be used to improve or optimize the operation of the equipment over time, thereby improving the performance of the retrofit.

The intent of Option B is to verify performance periodically or continuously with long-term measurements. Usage factors may be stipulated as in Option A or measured continuously.

Option B methods are appropriate for complex systems whose load or operating conditions are not well know or are highly dependent on external factors. Examples of projects where Option B may be appropriate include variable frequency drive installations, modifications to control systems, chiller system upgrades, or measures with high percentage of overall cost savings.

### **Option C – Whole Facility Energy Use**

Option C is a whole-building verification method. Savings are based on actual energy consumption as measured by the utility meter(s) and/or regression modeling. Estimated savings will vary over the contract term.

Option C verification methods determine savings by studying overall energy use in a facility. The evaluation of whole-building or facility-level metered data is completed using techniques ranging from simple billing comparison to multivariate regression analysis. Regression analysis can be used to account for weather and other factors to adjust the baseline and determine savings.

Option C is an appropriate and cost-effective method **ONLY** if facility operation is stable and savings are expected to exceed 20% of total energy consumption. However, Option C cannot verify the performance of individual measures but can verify the total performance of all measures including interactions

Option C methods are appropriate for projects whose measures have a high degree of interaction that would be difficult to predict, when overall energy savings are very large, or when dedicated utility meters are available for retrofitted equipment or systems.

### **Option D – Calibrated Simulation**

Option D is primarily a whole-building method but can be used at the component level. Savings are based on the results of a calibrated computer simulation model. Estimated savings may vary over the contract term if real weather data is used.

Option D uses a calibrated computer simulation models of component or whole-building energy consumption to determine energy savings. Linking simulation inputs to baseline and post-installation conditions completes the calibration, and may involve metering performance and operating factors before and after the retrofit. Specialized software packages, such as DOE-2, are used in Option D and the development of accurate building models requires substantial time and expertise.

Option D methods are appropriate for complex projects where complex system interactions need to be tracked. Due to the expense of properly conducting Option D, suitable projects should have substantial cost savings or major building renovations such as window replacements and building insulation.

### **Recommended Measure Specific M&V Methods**

Recommended M&V approaches are provided in this section for some of the most common measures, including: lighting upgrades, variable speed drives, constant speed motors, water measures, controls measures, boiler replacements, and chiller replacements.



### Lighting Upgrades

#### Option A

Measure operating hours for duration of 2 – 3 weeks during audit phase, during non-holiday timeframe. Use sampling plan with 80 / 20 confidence / precision (11 samples per group).

If hours of operation are well documented and stable, then conservative stipulated hours are acceptable if backed up with some monitoring during the audit.

Fixture powers based on standard tables (utility or EPRI lighting tables) only if inventory of equipment is very accurate (including lamp & ballast types);

Measure power of unknown or unusual fixture types.

Use diversity factor to determine demand reduction (% lights on during utility peak)

Heating penalty, cooling bonus are allowable where appropriate. Provide detailed calculation methodologies.

### Variable Speed Drives

#### Option B

Baseline operating hours should be measured. Baseline power should be measured; spot measurements acceptable for constant loads.

Post-retrofit operating hours and power (or speed) should be continuously measured (by EMCS), since demand savings are not guaranteed with VSDs (100% speed = 100% load). Adjust the baseline for actual use conditions if needed.

### Constant Speed Motors

#### Option A

Baseline operating hours should be measured. If hours of operation predictable (i.e. 24 hrs/day), stipulate post-retrofit operating hours. If hours of operation are variable or change, measure post-retrofit motor runtime.

Measure baseline and post-retrofit motor powers (depends on load factor, which vary); spot measurements okay for constant loads.

### Water Measures

#### Option C

If metering exists and usage is being affected by more than 20% then use Option C. Establish statistically significant relationship between use and dependent factors (weather, occupancy and/or other use factors) using regression analysis during audit ( $R^2 > 0.8$ ). Adjust baseline using post-retrofit conditions or normalize post-retrofit data to typical year data.

#### Option A



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Use if Option C is not applicable.

Assume consumption (i.e. flushes/day) and ensure water consumption model accounts for

no more than 75% of the water bill (result is conservative load assumptions)

If irrigation exists then use winter only data to extrapolate to all months.

Measure pre and post-retrofit fixture flow on a sampling basis (80% / 20%)

### **Controls Measures**

Option B Baseline conditions should

be verified through short-term measurements (i.e. document operating hours; demonstrate no economizer or reset).

Energy Management Control System (EMCS) should be used to collect all relevant post-retrofit load data (i.e. operating hours, actual cooling delivered by economizer, the hours of temperature reset). Use data in engineering calculations to determine savings.

Monthly monitoring of data collection recommended.

### **Boiler Replacement**

Option C

Savings should exceed 20% of metered usage.

Establish a statistically significant relationship between utility use and weather and/or other dependent factors (occupancy and/or other use factors) using regression analysis during audit ( $R^2 > 0.8$ ).

Post-retrofit use from utility bills or sub-metered data. Adjust baseline using actual weather or normalize post-retrofit data to typical year weather data.

Option A / B

Use if Option C is not applicable.

Operating hours and load should be measured and verified with analysis of utility data.

Baseline combustion efficiency should be measured. Post-retrofit combustion efficiency

should be measured every year.

Establish relationship between use and weather and/or other dependent factors using regression analysis during audit. Adjust baseline using actual weather or normalize post-retrofit data to typical year weather data.

### Chiller Replacement

#### Option B

Range of baseline efficiencies should be determined through measurements (kW/ton) If baseline efficiency is stipulated, the original (un-degraded) equipment efficiency should be used Use measured data to develop regression for weather vs. load Post-retrofit: continuously measure load and energy use Apply baseline efficiency to measured load data to determine savings. Adjust baseline using actual weather or normalize post-retrofit data to typical year weather data.